tion both in the text and in the diagrams. There are chapters on the nature of sound, waves of sound, musical scales, organ pipes, "time" and movement, the ear, and the voice. Nothing could be happier than the exquisite drawings by Miss Martin Mohun showing an ideal couple—a boy and girl—waltzing and drawing sound curves on the seashore. Mr. Lapidge's diagrams are also excellent. To assist the teacher six models, made by Mr. Lapidge, may be obtained for the illustration of the book for one guinea. These models show the structure of the middle ear and the chain of bones. They are accurate in all anatomical details. The box also contains a nightingale pipe, which is in miniature an adjustable stopped organ-pipe. Mr. Edmunds has succeeded in showing how science may be made interesting to young people. There is a constant appeal to observation and experiment, and the whole subject is treated in such a way as to promote the healthy development of the mental faculties in early life. JOHN G. MCKENDRICK.

Historical and Modern Atlas of the British Empire, specially prepared for Students. By C. Grant Robertson and J. G. Bartholomew. Sixty-four plates. (London: Methuen and Co., 1905.) Price 4*s.* 6*d.* net.

Philips' Model Atlas. Fifty Maps and Diagrams in Colour. (London: George Philip and Son, Ltd. n.d.) Price 6*d.* net.

THE first of these atlases is full of material designed to show students and teachers how intimately the studies of geography and history are related. The excellently executed plates serve as graphic object-lessons demonstrating the interdependence of cause and effect, and are skilfully conceived with a view to impress various important lessons pictorially. The atlas may be commended to the careful attention of both teachers of geography and history.

The sixpenny atlas of Messrs. Philip gives great prominence to photographic relief maps of the countries dealt with, and these plates will prove of great assistance in enabling young pupils to form mental pictures of the distribution of highlands and lowlands in the countries they are studying, thus providing them with a means to understand the direction of flow of rivers, the distribution of rainfall, and other important geographical features. This wonderfully cheap atlas deserves to be used widely in junior classes.

Natural Science in Hygiene, or the Life-History of the Non-Bacterial Parasites affecting Man. By Dr. James Rodger Watson. Pp. vi+62. (Bristol: John Wright and Co.; London: Simpkin, Marshall, Hamilton, Kent and Co., Ltd., 1905.) Price 1*s.* 6*d.* net.

IT is stated in the preface that this little book is intended to place before the student of public health, in a convenient and realistic way, the life-histories of those members of the vegetable and animal kingdoms which by their mode of life are of importance from a public health point of view, and with which he is expected to make himself familiar.

If by "student of public health" is meant the medical man who is going to devote his life to public health, the details given, though on the whole fairly accurate and up to date, are far too meagre and inadequate to be of much service, but the diagrams of life-cycles of the parasites discussed may serve to impress the facts on the memory. The book seems to be more suited to the requirements of the sanitary or meat inspector or health visitor than of the student of hygiene. R. T. HEWLETT.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

A Plea for Absolute Motion.

THE title of Prof. Schuster's letter is somewhat wider than its contents. The writer does not discuss whether the term "absolute motion" is significant, but only whether, assuming that the words have a definite meaning, the absolute motion of any body can be determined by physical inquiry. By implication he has himself answered the question in the negative, for at the critical stage of his discussion he introduces arguments which are not physical, but philosophical.

Prof. Schuster asks, "Does it require explanation that all star groups have the same velocity vector imposed upon them?" Certainly; it requires explanation no more and no less than any other distribution of velocities. It is highly desirable that the equations of the proper motions of the stars should be established and their past history traced until the physical circumstance that determined those motions is discovered. But this circumstance need not be a body at absolute rest. In the analogy which Prof. Schuster gives, the inhabitant of a gaseous molecule would be quite wrong if he decided that the rest of the containing vessel was absolute. Accordingly, Prof. Schuster has recourse to philosophical arguments. We have determined, he says, the velocity relative to a material body which does not come within the range of our observations. I should have thought that the mere fact that we had determined a velocity relative to it proved that it had come within the range of our observations; the deduction from the motion of some of the stars of the existence of dark satellites near them seems an analogous case; and since, he continues, this conclusion is absurd, the body must be replaced by something immaterial. Why is it less absurd to determine a velocity relative to an unknown immaterial than to an unknown material substance? Finally, since the something is immaterial, it cannot be in motion, and therefore it must be at absolute rest. The term immaterial may have many meanings: but I should have thought that an immateriality which precluded a substance from being in motion also precluded it from being at rest. A thought, for example, is incapable of motion, but it is equally incapable of rest; any application to it of the terms motion or rest is not true or false, but simply meaningless.

It may also be pointed out that if the "something at rest" is immaterial, the analogy breaks down. The distribution of the velocities of molecules in a gas depends on the collisions with the walls; but a star cannot collide with an immaterial boundary.

Prof. Schuster says that the attempt to make all motion relative to the æther is inconsistent. With all respect, I do not think he sees the point. The reasons for our preference of the Copernican to the Ptolemaic hypothesis are two-fold. The first reason is that the equations of motion of the solar system are simpler on the former theory. The second reason is precisely that which made the theologians object to the Copernican hypothesis; it points out that it is the sun, and not the earth, which holds a unique place in the solar system; this is a question of scientific taste. There are the same reasons for referring all motions to axes fixed in the æther—if we could determine them. Firstly, an attempt is being made to reduce all laws to electrodynamic laws, and these are simplest on the basis of a fixed æther. Secondly, the æther holds such a unique place in the physical universe that it is desirable to direct attention to the fact. The question of the "absolute motion of the æther"—if any—cannot come within the range of physical discussion any more than the "absolute motion of the sun" can come within the range of any discussion based on the properties of the solar system.

I should like to add a few remarks on the subject of "absolute rotation." "Rotation," it seems to me, like

"expansion" or "shear," is not the name of a distinct kind of motion—it is only a term introduced to abbreviate the discussion of a particular and important case of the relative translation of the particles of a body. Direct kinematical statements can only be made concerning particles of infinitesimal volume; such particles can only have translation, they cannot rotate. When bodies of finite volume are considered, they are analysed into particles the motions of which are then investigated. If there is no relative translation between the particles the motion is said to be pure translation; if there is relative translation the motion is said to be partly, or wholly, rotational. It is the characteristic of rotation that two particles situated on a straight line through the "axis of rotation" possess a relative acceleration along that line, and it is by the existence of these accelerations that absolute rotation is detected. If we can find a line such that any two particles situated on a line intersecting it are subject to relative accelerations along the latter, the body is said to rotate. It would be impossible for any observer on a rigid body to detect its rotation, for the relative accelerations of its particles could not be observed. If Foucault's pendulum were rigidly attached to the earth, or if the water in Newton's bucket were frozen, no observers on the earth or the bucket having cognisance of these bodies only could detect the "absolute rotation." In fact, the absolute rotation of bodies of finite volume is only a special case of the relative translation of particles.

NORMAN R. CAMPBELL.

Trinity College, Cambridge, March 18.

Interpretation of Meteorological Records.

THE series of curves given by Messrs. Lander and Smith's instruments, and published in NATURE of March 15, are most interesting, and one cannot help looking for the cause of the close relation between the movements of all the five instruments. It is with the view of offering an explanation of the sympathy between these instruments that the following lines are written. If I might venture to suggest a first cause of these movements, I would say it was the thunderstorm that drew the trigger which started all of them. The thunderstorm gave rise to a heavy fall of rain—a quarter of an inch in a few minutes—and this rainfall appears to have been the cause of the movement of all the instruments, and instead of being placed last in the series should have been put first. The effect of a heavy local fall of rain is to cause a down rush of air, the air being dragged downwards by the falling rain. This downward moving mass of air checks the wind, because its movement is at right-angles to the wind, hence the drop in the wind-velocity curve. The wind not being able to pursue its course gets deflected—in this case the curve shows it was to the north-west. The down rush of air where it meets the surface of the earth has its velocity reduced and direction of movement changed; its pressure is therefore increased, and the barograph shows that the pressure increased by the tenth of an inch. The downward rush of air would bring the air from the upper strata to the surface of the earth, and as this upper air would be in all probability the colder, it would cause a fall in the temperature, which the thermograph shows amounted to twelve degrees.

On one occasion I had an opportunity of seeing this downward movement of air produced by local rain. It was while making some meteorological observations on the top of the Eiffel Tower, in Paris. At first the weather was fine, and the dust-counter showed that the impure city air came to that height in great quantities. After a time a heavy shower came on which reduced the number of particles in the air, and at last the air became as free from dust as any air I have ever tested on the mountain tops of Switzerland. This increase in purity could only be due to the rain dragging down the upper purer air to the level of the top of the tower, as rain cannot wash the air to anything like that purity.

If the time scale of the curves in the instruments had been a good deal wider, and all the clocks going together, one could have found out whether the above explanation was correct or not, as we would expect the rainfall curve to begin first and all the others to follow, but from the closeness of the time scale of the curves no satisfactory information on this point can be obtained.

Ardenlea, Falkirk, N.B. JOHN AITKEN.

Agricultural Education and Colonial Development.

IN your issue of January 11 reference is made to the requirement which has recently arisen for specialists in agriculture and the allied sciences for employment in the British colonies and dependencies. The case, so far as India is concerned, may be stated very briefly. The Government is willing to spend money in the development of agricultural education and research, but the efficient recruitment of the department—or, more properly, departments, for there are eight local governments in India and Burma, each of which will have its own separate agricultural department—is not an easy matter. The educated native of India has not hitherto devoted the interest to the study of agriculture that he has to law and medicine, and men qualified to give instruction or conduct investigations in relation to this national industry are not to be found in the country. It is quite unnecessary to raise the question as to whether they will be obtainable in the future. This is one of the great desires of the Indian Government. In the meantime, however, men qualified to fill the offices above indicated are required, and a search has to be made elsewhere. In this respect, then, India appears to be drawing upon the same market as other countries.

In my view, the description of man that is required is one possessing a thorough knowledge of *principles*. The conditions of tropical agriculture are so very different from those of the British Isles that it is highly desirable for the Britisher to commence work in other continents with as open a mind as possible. I am not thinking so much of the agriculturist as of the botanist, entomologist, or chemist. Just as the chemist who has made himself master of pure chemistry makes eventually the best technical chemist, and finds it, indeed, easier to apply himself to any special technology than the so-called technical chemist, so, likewise, for agriculture in foreign countries, the men who will be most useful in the future will be those who have obtained a thorough knowledge of their particular science at college without any special reference to British agriculture. J. WALTER LEATHER.

Agricultural Research Institute, Pusa, Bengal, February 28.

Peculiar Ice Formation.

IN reply to Mr. James Foulds's inquiry in NATURE (March 15, p. 464) whether the prismatic forms of ice such as he has recently observed in Lancashire have been observed elsewhere, it may suffice to refer him to previous volumes of NATURE, more particularly to vols. xxxi. and xlvii., for letters from Messrs. Woodd-Smyth and McGee, also from myself. In the latter volume is an account by me of a more extended series of observations on these "crystallites" than previous observers appear to have made. Friability of soils is due to interstitial water.

Bishop's Stortford, March 16. A. IRVING.

I OBSERVED the same formation as that described by Mr. Foulds (p. 464) on bare soil, previously soaked with water, near Champéry, in Switzerland, as winter frosts began; and I believe that I have observed it everywhere as a common phenomenon.

I take it that the wet surface is first frozen, and that, as the cold penetrates, the ice exudes from the soil much as lanoline exudes from a lanoline tube, the water expanding as it freezes, and so forcing its way out between the more compact masses of soil, lifting the frozen surface-sheet.

The first touch of sun caused the structure to break up.

It struck me at the time that this was the cause of the injurious effect of frost on the surface of roads considered from the cyclist's point of view. W. LARDEN.

Devonport, March 16.